


AQA

GCSE Mathematics: Hub schools network meeting

Autumn 2018



2018 entries - national

- 716,000 entries for GCSE Maths in England
- 534,000 entries from 16-year-olds

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2018 entries: AQA

- 215,000 results for our GCSE Maths in England
 - 57% Foundation
 - 43% Higher
- 154,000 entries from 16-year-olds
 - 45% Foundation (-2% from 2017)
 - 55% Higher (+2% from 2017)
- 56000 post-16 entries
 - 91% Foundation
 - 9% Higher

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GCSE Maths (8300) outcomes – all candidates

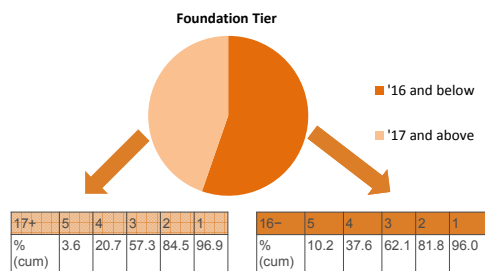
Grade	9	8	7	6	5	4	3	2	1
Cum %	2.7	7.6	15.0	24.7	39.9	58.9	76.7	89.9	97.5
% at grade	2.7	4.9	7.4	9.7	14.6	19.6	17.8	13.2	7.6

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Outcomes by age: Foundation

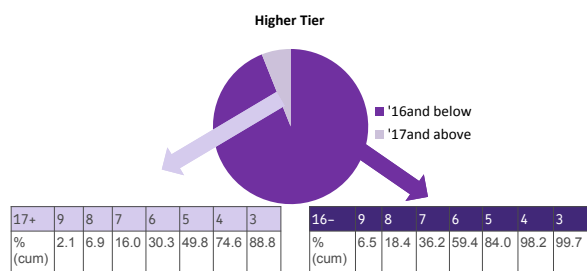


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Outcomes by age: Higher

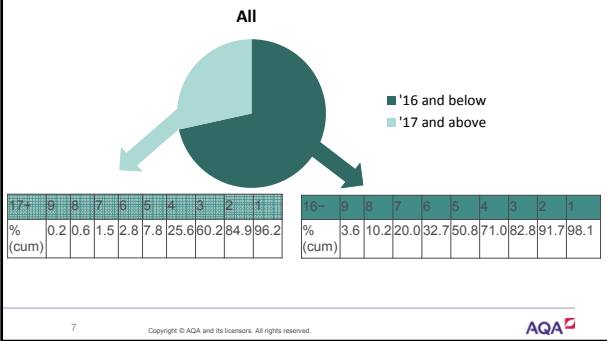


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Outcomes by age: Overall



Grade boundaries and outcomes: 16yo Overall

8300 June 2018 (16yo), AQA and national (JCQ)

Grade	9	8	7	6	5	4	3	2	1
Cum %	3.5	10.1	19.9	32.6	50.8	71.0	82.8	91.7	98.1
AQA	(-)	(+0.4)	(+0.2)	(+0.9)	(-0.2)	(+0.6)	(-0.2)	(-0.1)	(+0.1)
JCQ	3.6	10.5	20.0	31.9	50.4	70.9	83.8	92.7	98.1
% at grade	3.5	6.6	9.8	12.7	18.2	20.2	11.8	8.9	6.4

Foundation tier boundaries and outcomes

Boundaries and outcomes by tier (16yo) GCSE 8300 June 18: Foundation (68330 (-2220))

Grade	5	4	3	2	1
Boundary/240	161(+5)	125(+1)	92(+1)	59(-)	27(-)
Boundary (%)	67.1	52.1	38.3	24.6	11.3
Cum % of tier	10.1	37.5	62.1	81.9	96.0
Change from 2017	-4.1	-2.7	-2.8	-1.5	-0.3

Higher tier boundaries and outcomes

Boundaries and outcomes by tier (16yo) GCSE 8300 June 18: Higher (84050 (+6529))

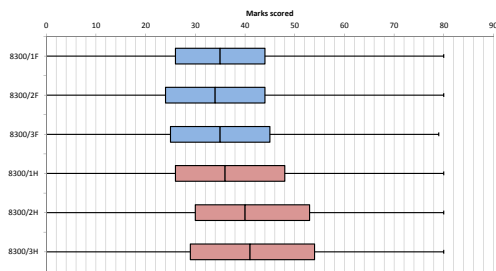
Grade	9	8	7	6	5	4	3 (allowed)
Boundary/240	201 (+12)	169 (+12)	138 (+13)	107 (+9)	77 (+5)	47 (+1)	32 (-1)
Boundary (%)	83.8	70.4	57.5	44.6	32.1	19.6	13.3
Cum % of tier	6.3	18.2	36.0	59.2	83.9	98.2	99.7
Change from 2017	-0.5	-0.4	-1.7	-1.3	-0.6	+0.4	+0.2

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Box plots for 8300 June 2018

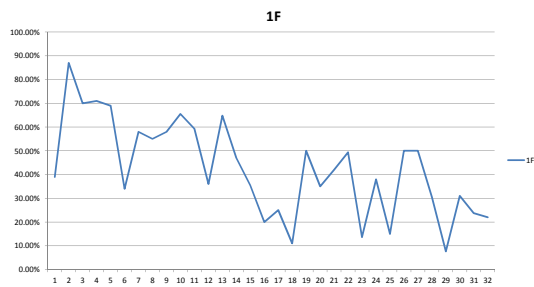


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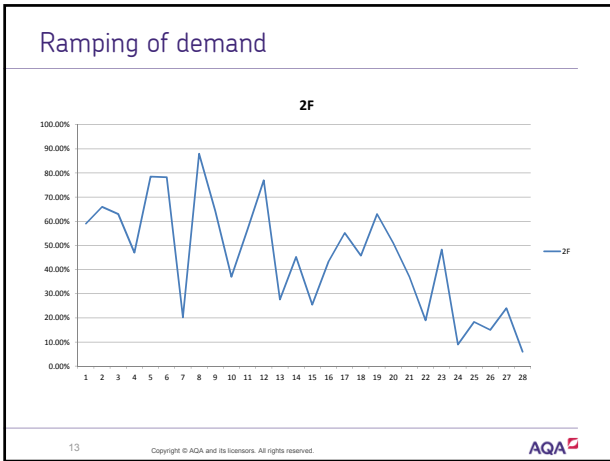
Ramping of demand

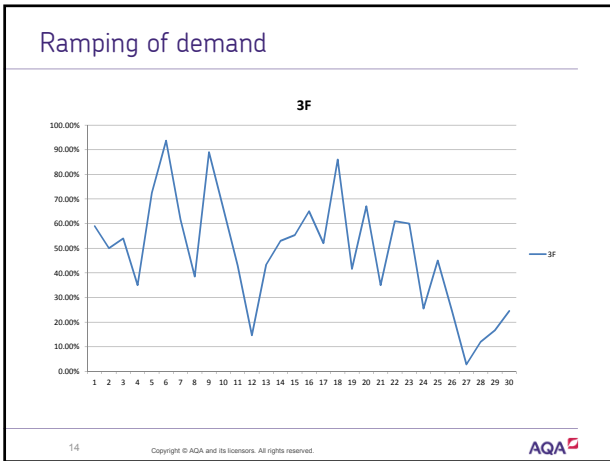


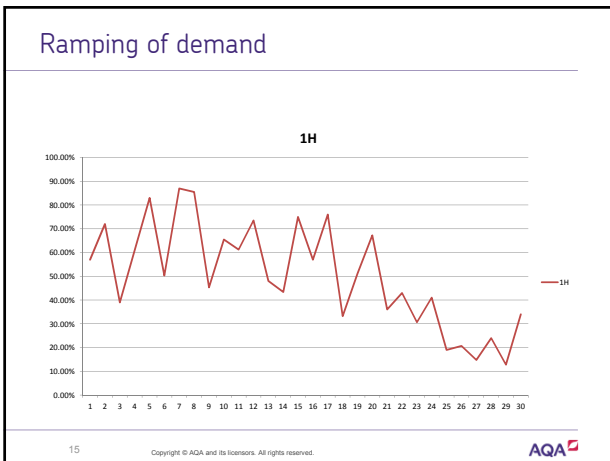
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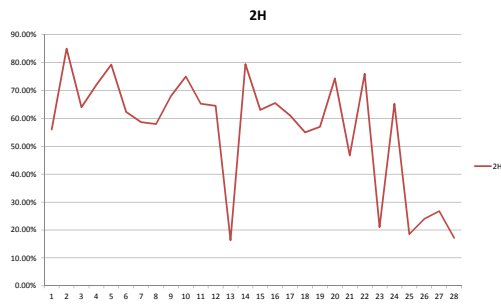








Ramping of demand

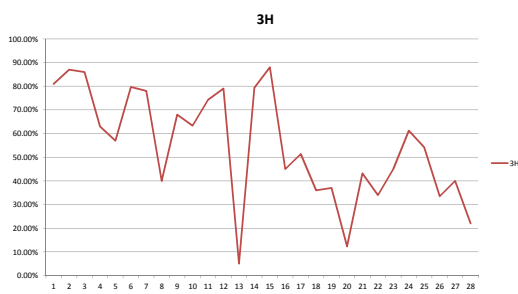


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Ramping of demand



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Multiple choice questions: How did we do?

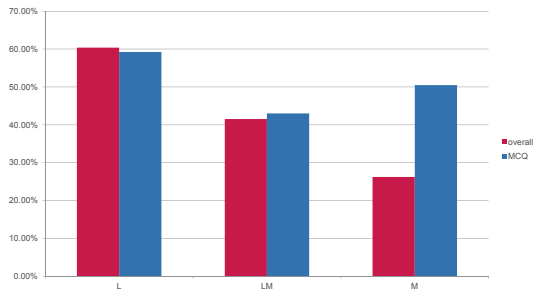
- The first four questions on each paper are multiple choice
- They will be low demand (Foundation tier) or medium demand (Higher tier)
- Four more multiple choice questions will be on each paper at a range of demand
- We compared the performance of multiple choice questions with the overall performance of questions at the same level of demand for each tier

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Multiple choice performance: Foundation tier

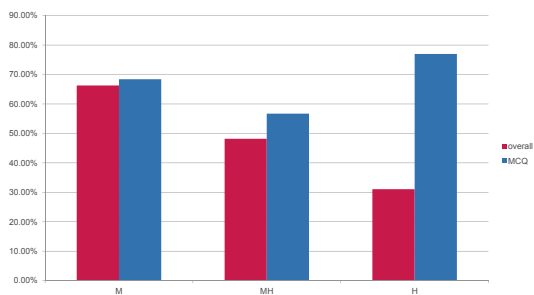


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Multiple choice performance: Higher tier



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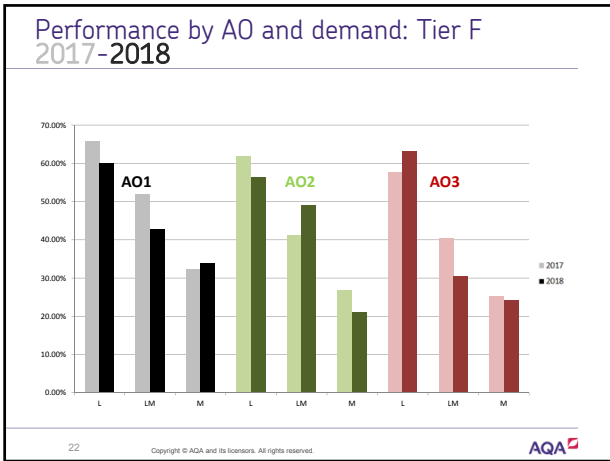
Reasoning and problem solving questions: How did we do?

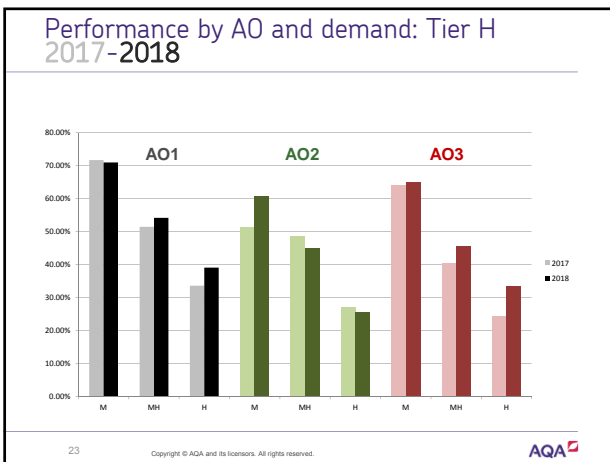
- Reasoning and problem solving (AO2 and AO3) questions are spread throughout the paper but tend to be more demanding so tend to appear later in any paper
- However, we seek to test AO2 and AO3 at all levels of demand
- Problem solving questions often contain some AO1 marks, so AO3 by item looks higher than AO3 by mark
- We looked at performance by AO across all papers at both tiers

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New AS and A-level Maths boundaries

A-level Maths		Raw			%		
Board	Marks	A*	A	E	A*	A	E
AQA	300	230	181	90	77%	60%	30%
Edexcel	300	229	184	70	76%	61%	23%
OCR	300	240	197	60	80%	66%	20%
MEI	275	218	197	115	79%	72%	42%

AS Maths		Raw		%	
Board	Marks	A	E	A	E
AQA	160	84	39	53%	24%
Edexcel	160	105	47	66%	29%
OCR	150	95	52	63%	35%
MEI	140	94	51	67%	36%

New AS and A-levels – continuous improvement

- **Continued focus on rewarding candidates for doing maths**
 - Catching people doing things right
 - Getting the most from our new mark scheme
 - Positive marking policy
- **Multiple choice**
 - 1 mark questions which mainly test standard techniques or facts.
- **Diagrams**
 - more space and giving candidates a nudge
- **Answer space**
 - slightly bigger for some questions
 - slightly fainter lines throughout

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If you want to know more...

- David McEwan, Curriculum Manager, will be delivering a webinar about our new A-levels, their key features and this summer's results
 - Live on September 25th if you'd like to ask him questions
 - The recording will be available after that
- Dan Rogan, Chair of Examiners will present the CPD course,
 - "A-level Maths: The Thinking Behind Great Assessment"
 - October and November
 - Available now on the professional development area at www.aqa.org.uk

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1F Q1

1 Work out $\frac{1}{2} \times 5$
 Circle your answer. [1 mark]

$\frac{5}{10}$ $2\frac{1}{2}$ $\frac{1}{10}$ $2\frac{1}{5}$

27

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1F Q6b

6 (b) Write $\frac{5}{8}$ as a decimal. [1 mark]

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1F Q18

18 Circle the ratio which is the same as the scale 1 cm represents 1 km [1 mark]

1 : 100 1 : 1000 1 : 10 000 1 : 100 000

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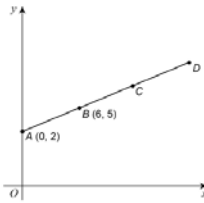
1F Q25 (1H Q6)

25 The height of Zak is 1.86 metres.
The height of Fred is 1.6 metres.
Write the height of Zak as a fraction of the height of Fred.
Give your answer in its simplest form. [3 marks]

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1F Q26 (1H Q7)

26 A (0, 2) and B (6, 5) are points on the straight line ABCD.



Not drawn accurately

$AB = BC = CD$

Work out the coordinates of D.

[3 marks]

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1F Q27 (1H Q8)

27 A coin is thrown 50 times.
It lands on heads 31 times.

27 (a) Write down the relative frequency it lands on heads. [1 mark]

Answer _____

27 (b) Raj says,
"The coin is biased towards heads."
Use the data to give a reason why he might be correct. [1 mark]

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1F Q29 (1H Q9)

29 The range of a set of numbers is $15\frac{1}{4}$
The smallest number is $-2\frac{7}{8}$

Work out the largest number.

[3 marks]

33

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2F Q7

7 x is 3 more than d .
 f is 5 less than d .

7 (a) Write an expression for x in terms of d . [1 mark]
 Answer _____

7 (b) Write an expression for f in terms of d . [1 mark]
 Answer _____

7 (c) Work out $x - f$.
 Simplify your answer. [2 marks]

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2F Q8

8 The numbers 1 to 12 are put in a grid.
 2, 4, 5, 7, 10 and 12 are shown.

		5	10
12			
4			
7		2	

Each of the four sides of the grid must add up to 26.
 Complete the grid using the numbers
 1, 3, 6, 8, 9 and 11 [3 marks]

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2F Q13

13 Here is a formula for the amount of water needed to cook rice.
 $w = 1.5r + 0.5$
 w is the number of cups of water needed
 r is the number of cups of rice to be cooked

13 (a) How many cups of water are needed to cook 7 cups of rice? [2 marks]

13 (b) How many cups of rice can be cooked with 20 cups of water? [3 marks]

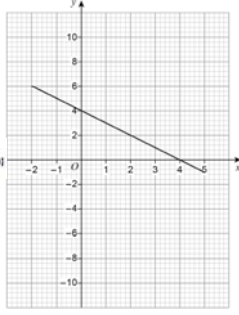
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2F Q15

15 The graph of $y = 4 - x$ for values of x from -2 to 5 is shown on the grid

15 (a) On the grid, draw the graph of $y = 2x - 5$ for values of x from -2 to 5. [2 marks]

15 (b) Use your graph to solve $2x - 5 = 4 - x$. [1 mark]



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2F Q17a

17 (a) A is due West of B.
Write down the bearing of A from B. [1 mark]

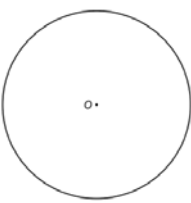
Answer _____°

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2F Q21

21 (a) A circle has radius 4.2 cm.
Work out the length of the circumference.
Give your answer to 1 decimal place. [3 marks]

21 (b) The circle below has centre O.
Draw a sector on the circle. [1 mark]



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2F Q27 (2H Q9)

27

Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius

A container is a hemisphere of radius 30 cm



Sand fills the container at a rate of 4000 cm^3 per minute.
Does it take **less than** a quarter of an hour to fill the container?
You **must** show your working.

[3 marks]

40

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2F Q28 (2H Q9)

28 The length of each side of a regular pentagon is 8.4 cm to 1 decimal place.

28 (a) Complete the error interval for the length of one side. [2 marks]

_____ cm < length < _____ cm

28 (b) Complete the error interval for the perimeter. [1 mark]

_____ cm < perimeter < _____ cm

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3F Q4

4 Circle the shortest length. [1 mark]

1200 cm 0.13 km 110 m 140 000 mm

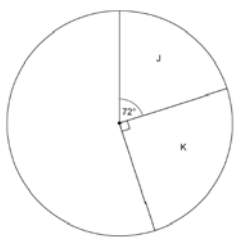
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3F 19

In an election there were four candidates, J, K, L and M.
 Fran is drawing a pie chart to show the results.
 The sectors for J and K have been drawn.



19 (a) Twice as many people voted for L as voted for M.
 Complete the pie chart. [3 marks]

19 (b) Altogether, 16 200 people voted.
 How many voted for J? [2 marks]

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3F 26 (3H Q7)

Investment A Save £150 per month for 2 years.
 2.5% interest is added to the total amount saved.

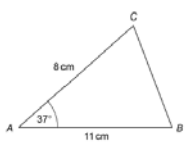
Investment B Invest £3500
 Compound interest is added at 3% per year.

After 2 years, how much more is investment B worth than investment A? [4 marks]

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3F 16

16 A sketch of triangle ABC is shown.



Not drawn accurately

In the space below, complete an accurate drawing of triangle ABC. [2 marks]

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3F 22

22 Here is a rule for a sequence.

After the first two terms, each term is half the sum of the previous two terms

22 (a) Here is a sequence that follows this rule.

2 10 6

Show that the 6th term is the first one that is not a whole number. [3 marks]

22 (b) A different sequence follows the same rule.

The 1st term is 4
The 3rd term is 9.5

4 9.5

Work out the 2nd term. [3 marks]

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3F Q30a (3H Q11a)

30 $a = \begin{pmatrix} 6 \\ -10 \end{pmatrix}$ $b = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $c = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

30 (a) Work out $a + b + c$ [2 marks]

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1H Q3

3 Circle the expression that is equivalent to $3a - a \times 4a + 2a$ [1 mark]

$8a^2 + 2a$ $12a^2$ $5a - 4a^2$ $3a - 6a^2$

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1H Q14

14 Patterns are made using straight lines and arcs.

14 (a) **Pattern A (one row)** **Pattern B (two rows)**

More rows are added to **Pattern B** so that
 number of straight lines : number of arcs = 10 : 9

How many rows are added? [2 marks]

14 (b) A different pattern is made using 20 straight lines and 16 arcs.
 The straight lines and arcs are made from metal.
 20 straight lines cost €12
 cost of one straight line : cost of one arc = 2 : 3
 Work out the total cost of the metal in the pattern. [3 marks]

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1H Q22

22

Which of these represents the shaded region?
 Circle your answer. [1 mark]

$A \cap B'$ B' $A \cup B'$ $A' \cup B'$

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1H Q25

Here is a sketch of the graph of $y = \cos x$ for values of x from 0° to 360°

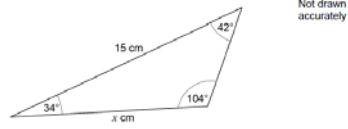
(a) $\cos x = \cos 60^\circ$
 Work out the value of x when $90^\circ < x < 360^\circ$ [1 mark]

25 (b) $\cos x = -\cos 60^\circ$
 Work out the value of x when $180^\circ < x < 360^\circ$ [1 mark]

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1H Q17

17 Here is a triangle.



Circle the correct equation.

[1 mark]

$\frac{\sin x}{42} = \frac{\sin 15^\circ}{104}$

$\frac{x}{\sin 42^\circ} = \frac{15}{\sin 104^\circ}$

$\frac{\sin x}{34} = \frac{\sin 15^\circ}{104}$

$\frac{x}{\sin 42^\circ} = \frac{15}{\sin 34^\circ}$

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1H Q20

20 A linear sequence starts

$a + 2b \quad a + 6b \quad a + 10b \quad \dots \quad \dots$

The 2nd term has value 8
The 5th term has value 44

Work out the values of a and b .

[4 marks]

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2H Q13

13 Show that, for $x \neq -1$

$\frac{8x^2 - 8}{4x + 4}$ simplifies to the form $ax + b$ where a and b are integers.

[3 marks]

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2H Q23

23 Solids X and Y are similar.
 X has volume 64 cm^3
 Y has volume 343 cm^3
 The surface area of X is 176 cm^2
 Work out the surface area of Y. [3 marks]

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2H Q26

26 A curve has equation $y = 4x^2 + 5x + 3$
 A line has equation $y = x + 2$
 Show that the curve and the line have **exactly** one point of intersection.
 Do **not** use a graphical method. [4 marks]

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2H Q18

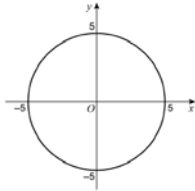
18 The solution of $3^x = 300$ lies between two consecutive integers.
 Work out the two integers. [1 mark]

Answer _____ and _____

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2H Q22

22 A circle, centre O , passes through $(5, 0)$.



What is the equation of the circle?
Circle your answer.

[1 mark]

- $x^2 + y^2 = 25$ $x^2 + y^2 = 5$ $x^2 + y^2 = 10$ $x^2 + y^2 = 100$

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3H Q13

13 Tick all the statements that are true for any rhombus.

[1 mark]

The diagonals are lines of symmetry

The diagonals bisect each other

The diagonals are perpendicular

The diagonals are equal in length

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3H Q18

18 Show that, for $x \neq 0$

$$\frac{x+4}{3x} - \frac{5}{2x}$$

can be written in the form $\frac{ax+b}{cx}$ where a , b and c are integers.

[3 marks]

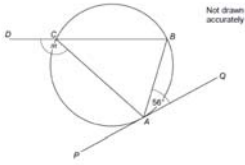
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3H Q22

- 22 A, B and C are points on a circle.
DCB is a straight line.
PAQ is a tangent to the circle.



Sam is trying to work out the size of angle x .
Here is his working:

angle $ACB = 56^\circ$ angles in the same segment are equal
 $x = 180^\circ - 56^\circ$ angles at a point on a straight line add up to 180°
 $x = 124^\circ$

Make a criticism of his working.

[1 mark]



3H Q15

- 15 Amy has x beads.
Billy has three more beads than Amy.
Carly has four times as many beads as Billy.

Circle the expression for the number of beads that Carly has.

[1 mark]

$4x + 3$ $3x + 4$ $4(x + 3)$ $x + 12$

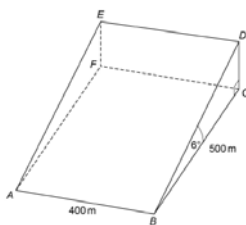
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3H Q25

ABCDEF is a triangular prism which represents part of a hill.
ABCF is the horizontal rectangular base.
D is vertically above C.



- 25 (a) Work out the height CD.

- 25 (b) Jamil walks in a straight line from A to D.

Work out the size of angle DAC.
You must show your working.

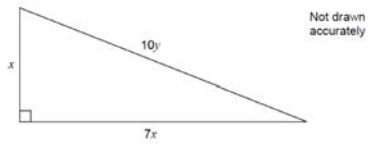
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3H Q20

20 All dimensions are in centimetres.



Use Pythagoras' theorem to work out the exact value of $\frac{x}{y}$

[3 marks]

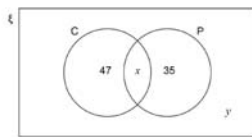
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2H Q25

25 The Venn diagram shows some information about 150 students.
 ξ = 150 students
 C = students who study Chemistry
 P = students who study Physics



The probability that a Physics student, chosen at random, also studies Chemistry is $\frac{5}{12}$
 One of the 150 students is chosen at random.

Work out the probability that the student does not study either Chemistry or Physics.

[4 marks]

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3H Q8

8 (a) Show that the lines $y = 3x + 7$ and $2y - 6x = 8$ are parallel.
 Do not use a graphical method.

[3 marks]

8 (b) Is the point $(-5, -6)$ above, below or on the line $y = 3x + 7$?
 Tick **one** box.

Above Below On the line

You must show your working.
 Do not use a graphical method.

[2 marks]

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Face-to-face Events

Title	Date	Time	Location
A-level Maths: Getting started	23-10-18	10:15 – 15:45	London
A-level Maths: The thinking behind great assessment	24-10-18	10:15 – 15:45	London
A-level Maths: Getting started	05-11-18	10:15 – 15:45	Manchester
A-level Maths: The thinking behind great assessment	06-11-18	10:15 – 15:45	Manchester
GCSE Maths: Feedback on the 2018 exams	07-11-18	10:15 – 15:45	Birmingham
GCSE Maths: Making the higher tier content more accessible	09-11-18	10:15 – 15:45	Manchester
GCSE Maths: Making the higher tier content more accessible	12-11-18	10:15 – 15:45	London
GCSE Maths: Feedback on the 2018 exams	13-11-18	10:15 – 15:45	Manchester
GCSE Maths: Teaching foundation to less able learners	19-11-18	10:15 – 15:45	London
GCSE Maths: Teaching foundation to less able learners	23-11-18	10:15 – 15:45	Manchester
GCSE Maths: Feedback on the 2018 exams	04-12-18	10:15 – 15:45	London

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Online Events

Title	Date	Time	Location
A-level Maths: Effective use of technology inc data set	12-11-18	16:00 – 18:00	Online
A-level Maths: The thinking behind great assessment	13-11-18	16:00 – 18:00	Online
GCSE Maths: Feedback on the 2018 exams	14-11-18	16:00 – 18:00	Online
A-level Maths: The thinking behind great assessment	19-11-18	16:00 – 18:00	Online
GCSE Maths: Feedback on the 2018 exams	05-12-18	16:00 – 18:00	Online

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A-level Maths webinar

We recently ran an A-level Maths webinar presented by Curriculum Manager, David McEwan who takes you through what went well in the 2018 series and explains how our different assessment elements have worked well for your students.

In particular, David will be helping you to understand:

- results and grade boundaries – some data and insight into how students performed
- how to deliver consistent assessment – examples of our live questions to see the thinking behind them and how they benefit your students.

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A-level Maths webinar

You'll also find more in-depth coverage of the series at our feedback meetings. Visit our professional development page for dates.

To access the webinar, please visit bit.ly/mathsweb

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“Hidden” gems on All About Maths

- Intermediate Tier and GCSE Additional Maths papers:
 - <https://allaboutmaths.aqa.org.uk/legacymathsQPs>
- Bridging the Gap resources
 - <https://allaboutmaths.aqa.org.uk/bridgingthegap>
- Marking Guidance and Exercise
 - <https://allaboutmaths.aqa.org.uk/1358>
- Problem solving and Reasoning guidance and questions
 - <https://allaboutmaths.aqa.org.uk/1355>

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Thank you
